

**What is Claimed:**

1. A system for the automatic mapping of an interior of a building, comprising a plurality of interconnected rooms, comprising:

5 means, transportable by a user, for generating data indicative of a distance between a user and walls of a room in which the user is presently located;

means for locating a position of said user in said building; and

means for cumulatively mapping the extent of each room in which the user is located to produce a map of an interior of said building.

10 2. The system for the automatic mapping of an interior of a building of claim 1 wherein said means for generating data comprises:

means for transmitting a signal toward said walls of said room;

15 means for receiving components of said transmitted signal reflected off said walls of said room; and

means for determining a distance from said user to said walls as a function of the time difference between transmitting said signal and receipt of said reflected components of said transmitted signal.

20 3. The system for the automatic mapping of an interior of a building of claim 2 wherein said means for generating data further comprises:

means for identifying a presence of an opening in said walls.

25 4. The system for the automatic mapping of an interior of a building of claim 1 wherein said means for generating data comprises:

means for concurrently measuring a distance between a user and a plurality of walls of a room in which the user is presently located.

5. The system for the automatic mapping of an interior of a building of claim

1 wherein said means for locating comprises:

inertial guidance means for dynamically measuring movement of said user as said user moves through said rooms of said building.

5           6.     The system for the automatic mapping of an interior of a building of claim 5 wherein said means for locating further comprises:

means for dynamically measuring movement of said user using at least one of movement sensors comprising: gyroscope, accelerometer, rotation detector.

10           7.     The system for the automatic mapping of an interior of a building of claim 1 wherein said means for cumulatively mapping comprises:

means for creating a virtual map of said building using said generated distance data and said user location data for each room traversed by said user.

15           8.     The system for the automatic mapping of an interior of a building of claim 1 further comprising:

sensor means for measuring at least one of building and user parameters: ambient temperature, presence of toxic gasses, oxygen level in a breathing tank, time to exhaustion of breathable air in the breathing tank, user breathing rate and heart rate  
20 sensors, user time in area, a user failure to move indicator, command and control alerts, text readout of messages from the command and control system, voice activation of the unit including the display, location of other users in the vicinity, warning indications.

25           9.     The system for the automatic mapping of an interior of a building of claim 1 further comprising:

means for displaying said map to said user.

10.     A method of automatic mapping of an interior of a building, comprising a plurality of interconnected rooms, comprising the steps of:

generating, using apparatus transportable by a user, data indicative of a distance between a user and walls of a room in which the user is presently located;  
 means for locating a position of said user in said building; and  
 means for cumulatively mapping the extent of each room in which the user is  
 5 located to produce a map of an interior of said building.

11. The method of automatic mapping of an interior of a building of claim 10 wherein said step of generating data comprises:

transmitting a signal to said walls of said room;  
 10 receiving components of said transmitted signal reflected off said walls of said room; and  
 determining a distance from said user to said walls as a function of the time difference between transmitting said signal and receipt of said reflected components of said transmitted signal.

12. The method of automatic mapping of an interior of a building of claim 11 wherein said step of generating data further comprises:  
 identifying a presence of an opening in said walls.

13. The method of automatic mapping of an interior of a building of claim 10 wherein said step of generating data comprises:

concurrently measuring a distance between a user and a plurality of walls of a room in which the user is presently located.

14. The method of automatic mapping of an interior of a building of claim 10 wherein said step of locating comprises:

dynamically measuring movement of said user via an inertial guidance apparatus for as said user moves through said rooms of said building.

15. The method of automatic mapping of an interior of a building of claim 14 wherein said step of locating further comprises:

dynamically measuring movement of said user using at least one of movement sensors comprising: gyroscope, accelerometer, rotation detector.

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16. The method of automatic mapping of an interior of a building of claim 10 wherein said step of cumulatively mapping comprises:

creating a virtual map of said building using said generated distance data and said user location data for each room traversed by said user.

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17. The method of automatic mapping of an interior of a building of claim 10 further comprising the step of:

measuring at least one of building and user parameters: ambient temperature, presence of toxic gasses, oxygen level in a breathing tank, time to exhaustion of breathable air in the breathing tank, user breathing rate and heart rate sensors, user time in area, a user failure to move indicator, command and control alerts, text readout of messages from the command and control system, voice activation of the unit including the display, location of other users in the vicinity, warning indications.

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18. The method of automatic mapping of an interior of a building of claim 10 further comprising the step of:

displaying said map to said user.

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19. A system for the automatic mapping of an interior of a building, comprising a plurality of interconnected rooms, comprising:

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tracker module means, transportable by a user, comprising:

transducer means for generating data indicative of a distance between a user and walls of a room in which the user is presently located,

inertial guidance means for generating data indicative of a position of said

user in said building; and

command module means for cumulatively mapping the extent of each room in which the user is located to produce a map of an interior of said building.

5           20.    The system for the automatic mapping of an interior of a building of claim 19 wherein said transducer means comprises:

transmitter means for transmitting a signal to said walls of said room,

receiver means for receiving components of said transmitted signal reflected off said walls of said room; and

10           computing means for determining a distance from said user to said walls as a function of the time difference between transmitting said signal and receipt of said reflected components of said transmitted signal.

15           21.    The system for the automatic mapping of an interior of a building of claim 20 wherein said transducer means further comprises:

doorway detecting means for identifying a presence of an opening in said walls.

20           22.    The system for the automatic mapping of an interior of a building of claim 19 wherein said transducer means comprises:

means for concurrently measuring a distance between a user and a plurality of walls of a room in which the user is presently located.

25           23.    The system for the automatic mapping of an interior of a building of claim 19 wherein said inertial guidance means comprises:

accelerometer means for dynamically measuring movement of said user as said user moves through said rooms of said building.

24.    The system for the automatic mapping of an interior of a building of claim 19 wherein said inertial guidance means comprises:

gyroscope means for dynamically measuring movement of said user as said user moves through said rooms of said building.

25. The system for the automatic mapping of an interior of a building of claim 19 wherein said inertial guidance means comprises:

movement sensor means for dynamically measuring movement of said user using at least one of movement sensors comprising: gyroscope, accelerometer, rotation detector.

26. The system for the automatic mapping of an interior of a building of claim 19 wherein said command module means comprises:

mapping means for creating a virtual map of said building using said generated distance data and said user location data for each room traversed by said user.

27. The system for the automatic mapping of an interior of a building of claim 19 wherein said tracker module means further comprises:

sensor means for measuring at least one of building and user parameters: ambient temperature, presence of toxic gasses, oxygen level in a breathing tank, time to exhaustion of breathable air in the breathing tank, user breathing rate and heart rate sensors, user time in area, a user failure to move indicator, command and control alerts, text readout of messages from the command and control system, voice activation of the unit including the display, location of other users in the vicinity, warning indications.

28. The system for the automatic mapping of an interior of a building of claim 19 wherein said tracker module means further comprises:

heads-up display means for displaying said map to said user.